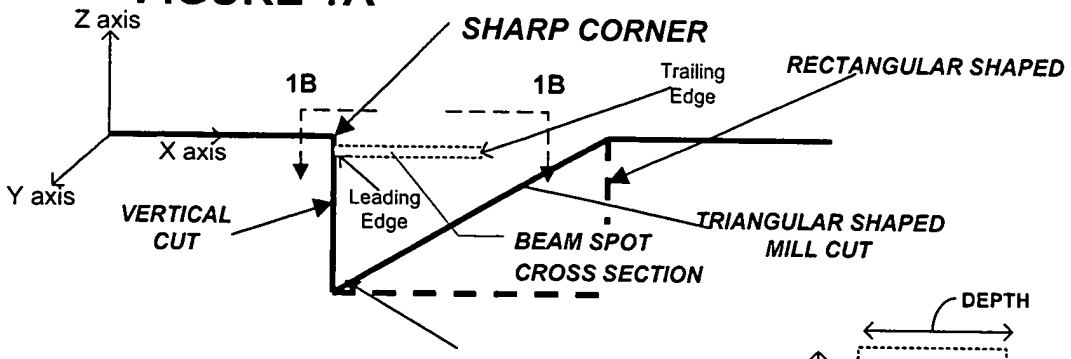
FIGURE 1A



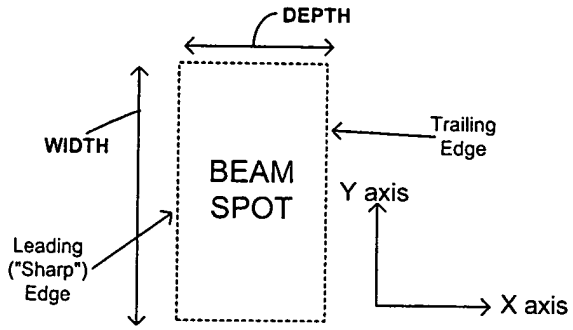


FIGURE 1B

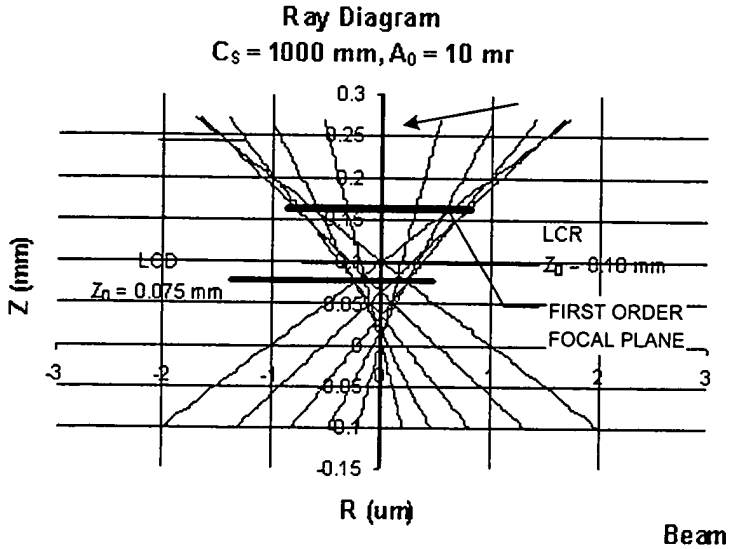


FIGURE 2A

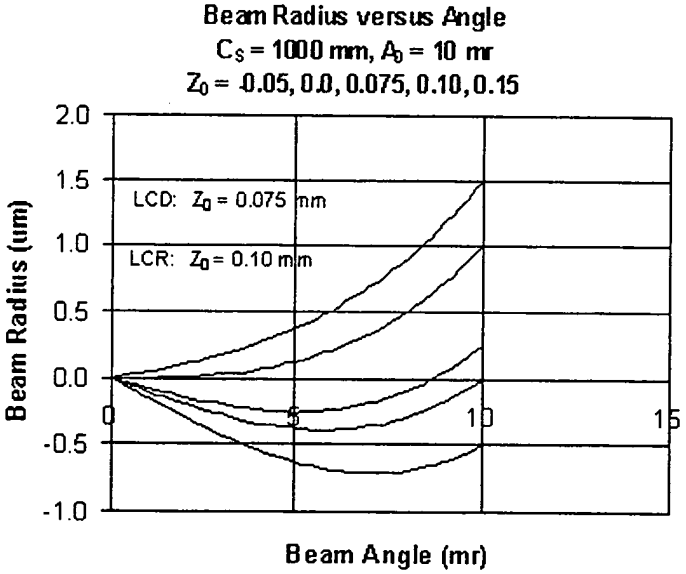


FIGURE 2B

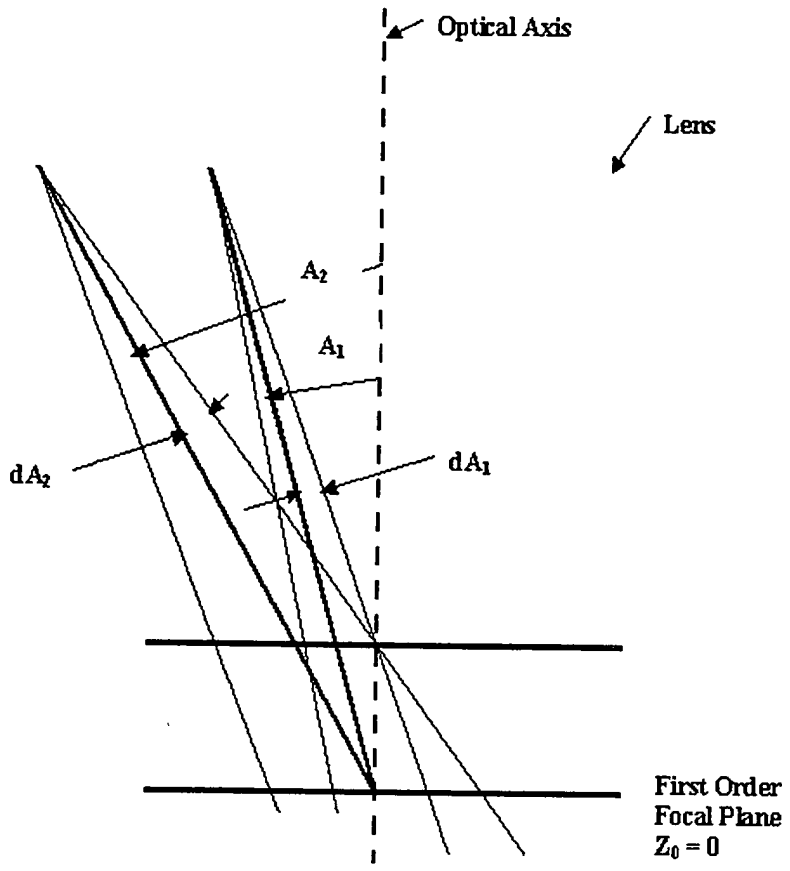


FIGURE 3

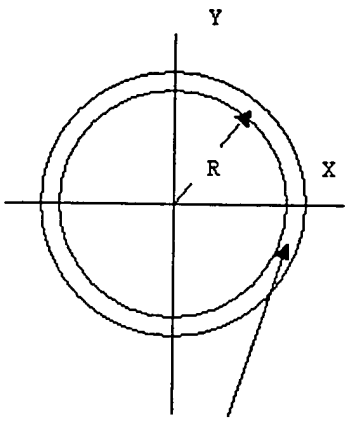


FIGURE 6A

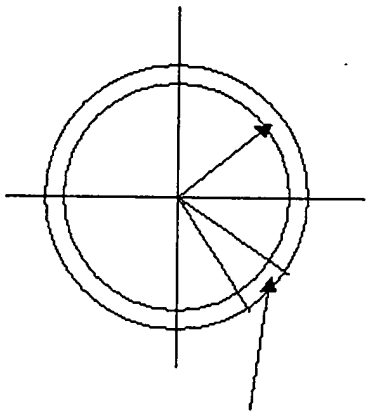


FIGURE 6B

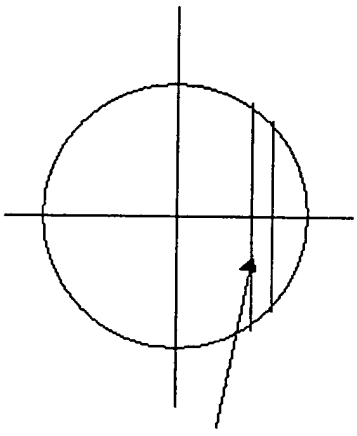


FIGURE 6C

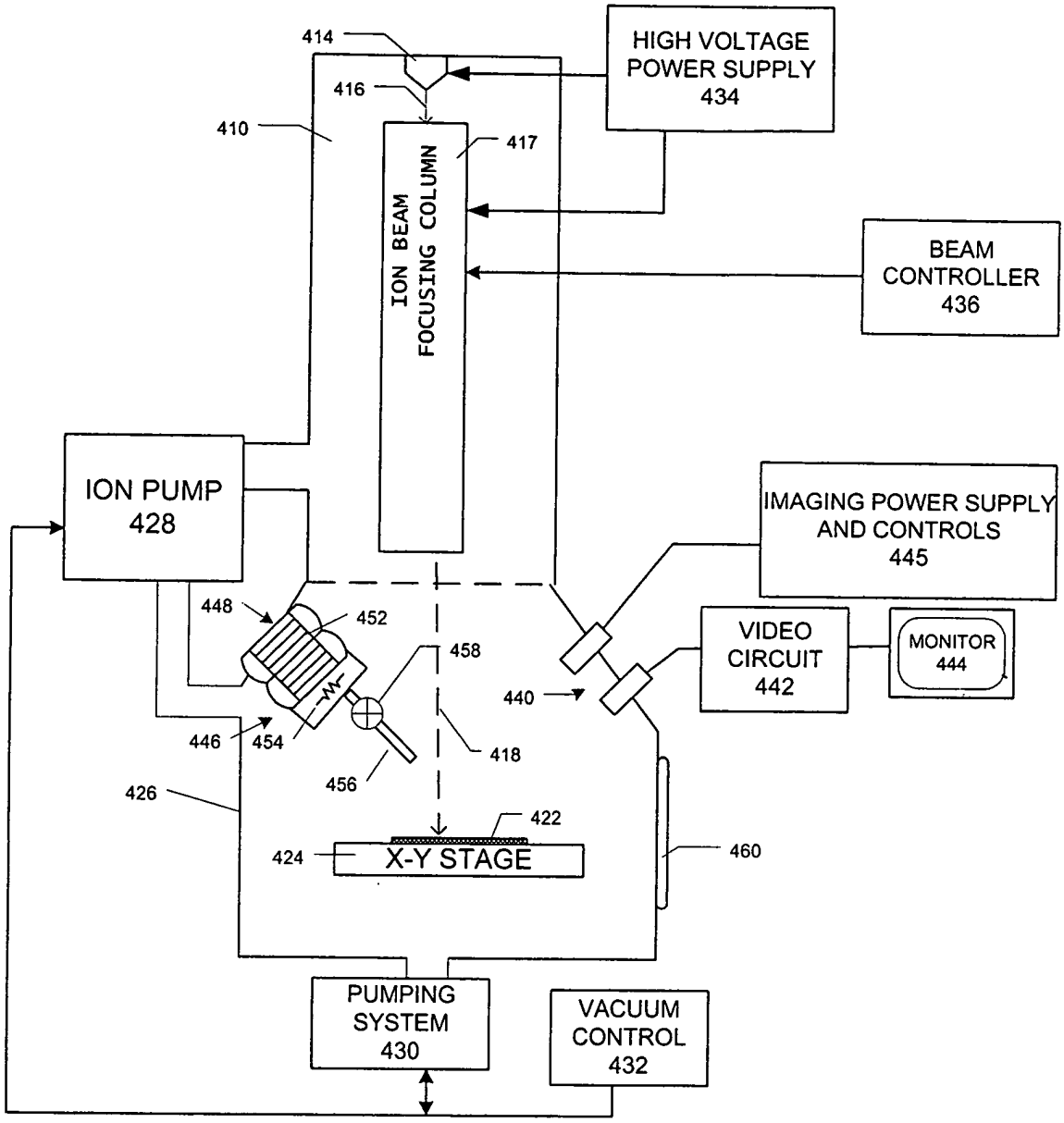

414
HIGH VOLTAGE POWER SUPPLY 434
416
410
417
ION BEAM FOCUSING COLUMN
BEAM CONTROLLER 436
ION PUMP 428
IMAGING POWER SUPPLY AND CONTROLS 445
448
452
458
VIDEO CIRCUIT 442
MONITOR 444
440
446
454
418
456
426
422
424
X-Y STAGE
460
PUMPING SYSTEM 430
VACUUM CONTROL 432

FIGURE 4

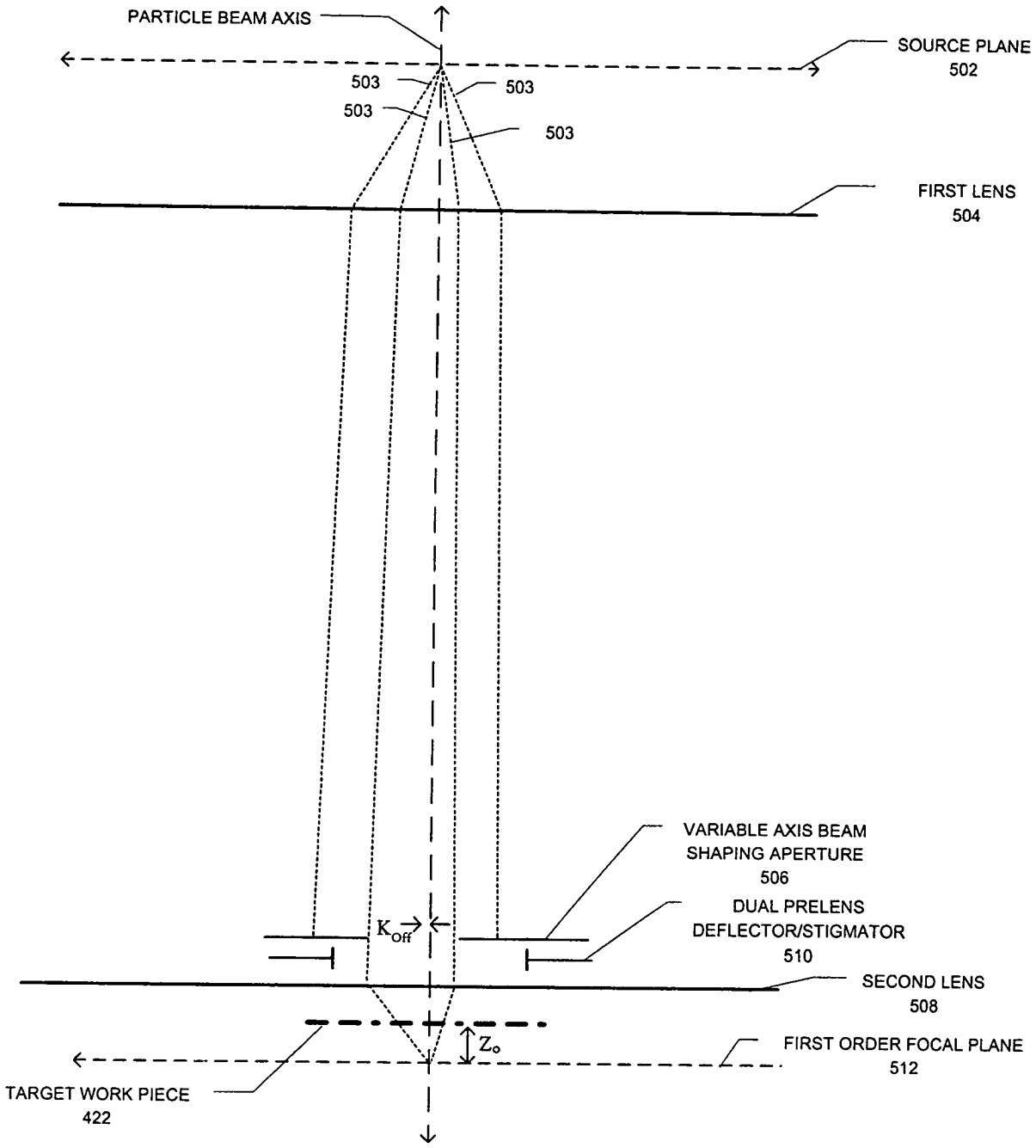

PARTICLE BEAM AXIS
SOURCE PLANE
502
503
503
503
503
FIRST LENS
504
VARIABLE AXIS BEAM
SHAPING APERTURE
506
DUAL PRELENS
DEFLECTOR/STIGMATOR
510
K_{off}
SECOND LENS
508
Z_o
FIRST ORDER FOCAL PLANE
512
TARGET WORK PIECE
422

FIGURE 5

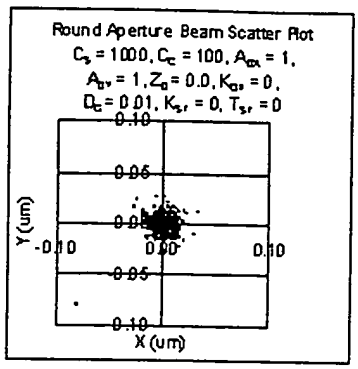


FIGURE 7A

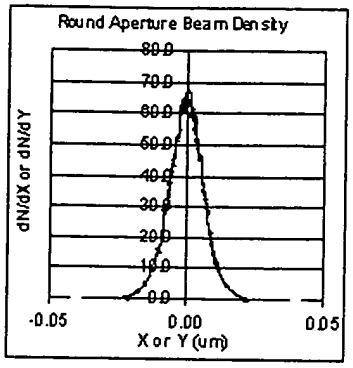


FIGURE 7B

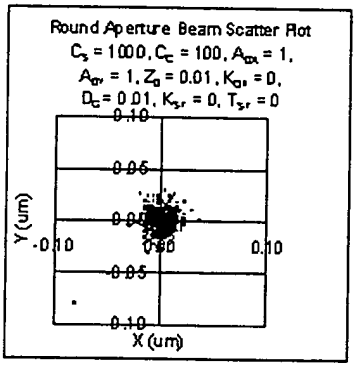


FIGURE 8A

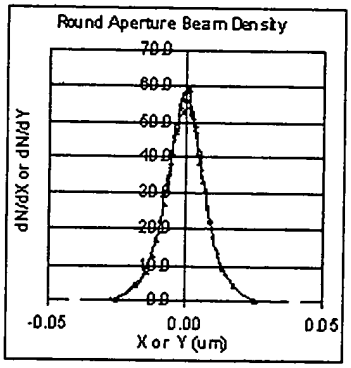


FIGURE 8B

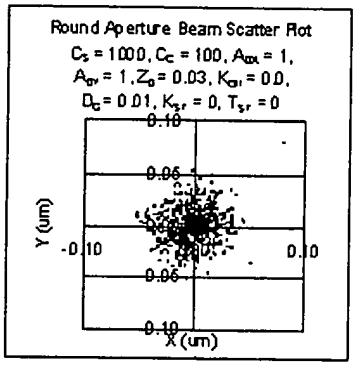


FIGURE 9A

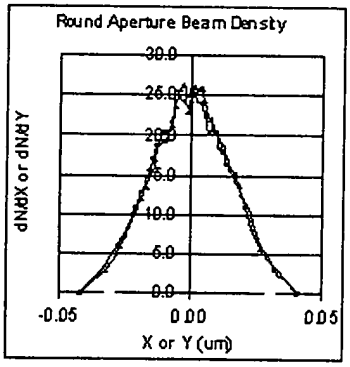


FIGURE 9B

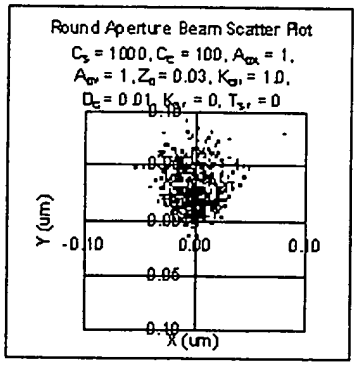


FIGURE 10A

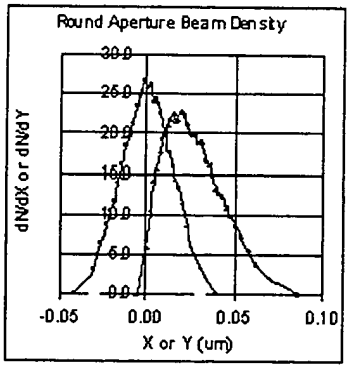


FIGURE 10B

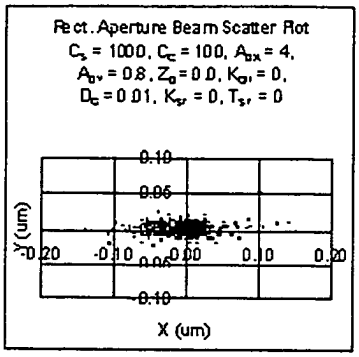


FIGURE 11A

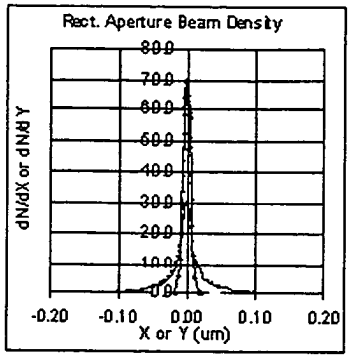


FIGURE 11B

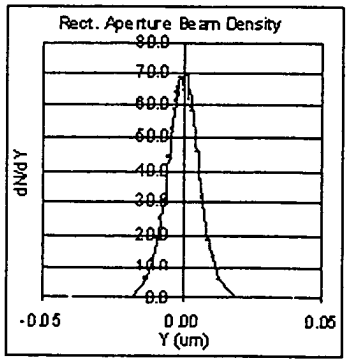


FIGURE 11C

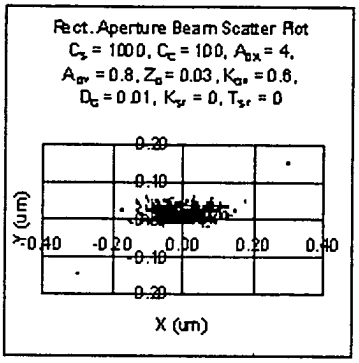


FIGURE 12A

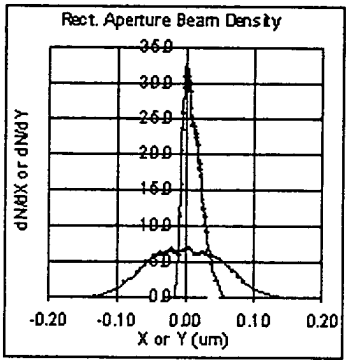


FIGURE 12B

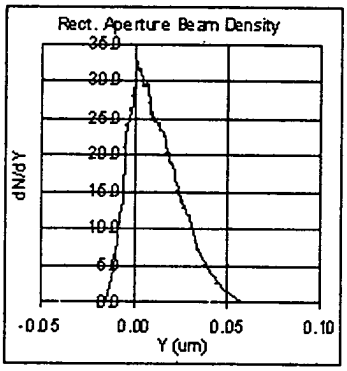


FIGURE 12C

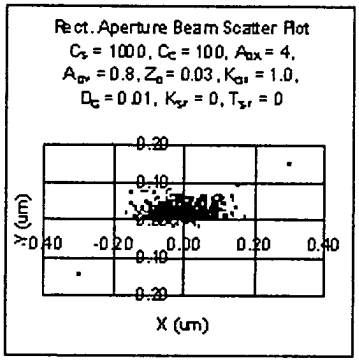


FIGURE 13A

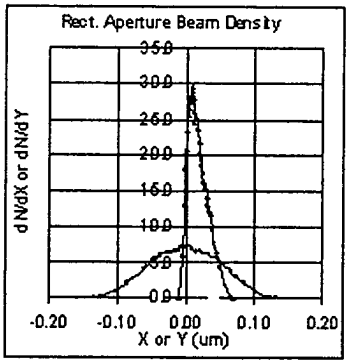


FIGURE 13B

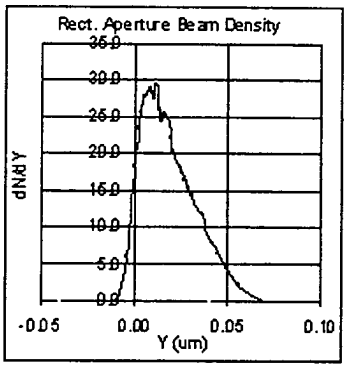


FIGURE 13C

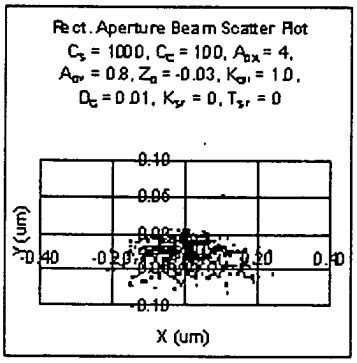


FIGURE 14A

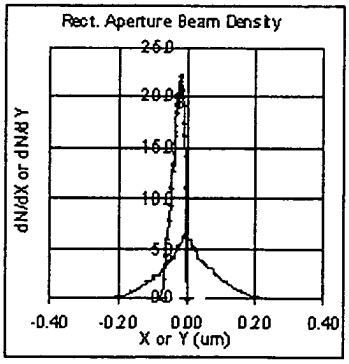


FIGURE 14B

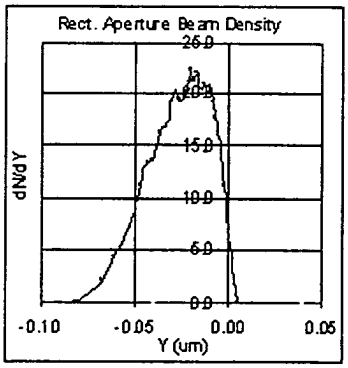


FIGURE 14C

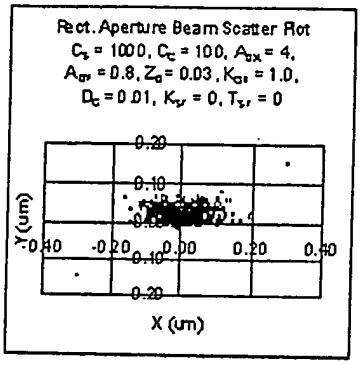


FIGURE 15A

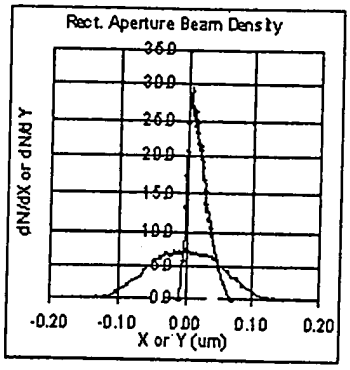


FIGURE 15B

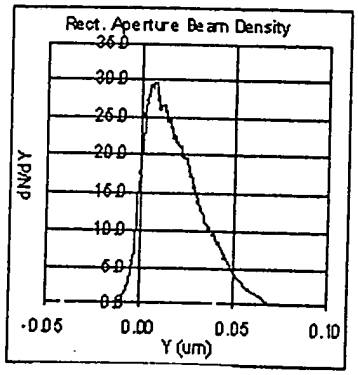


FIGURE 15C

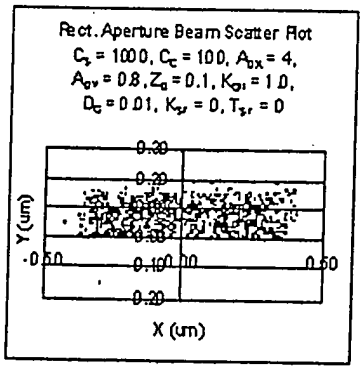


FIGURE 16A

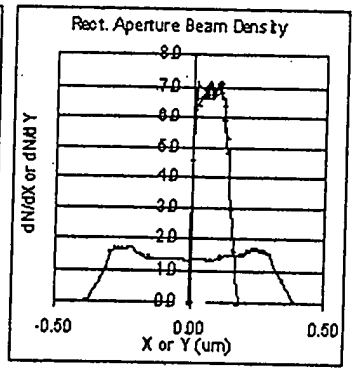


FIGURE 16B

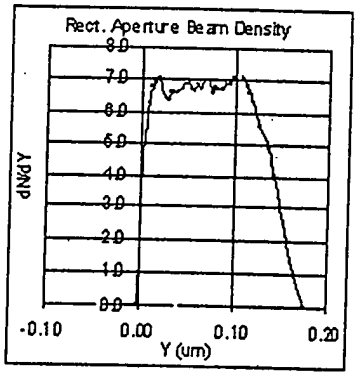


FIGURE 16C

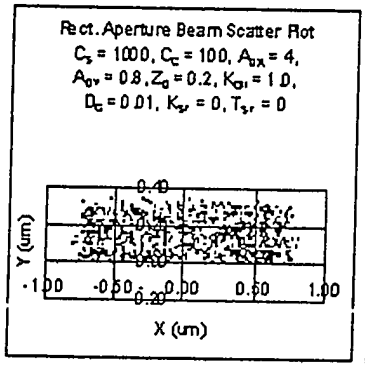


FIGURE 17A

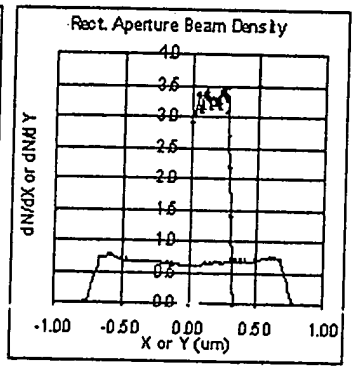


FIGURE 17B

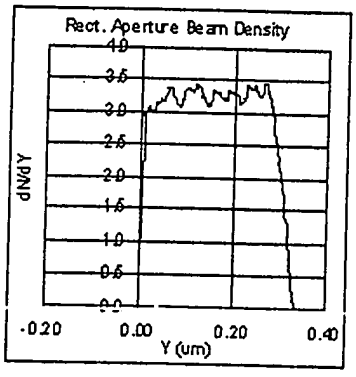


FIGURE 17C

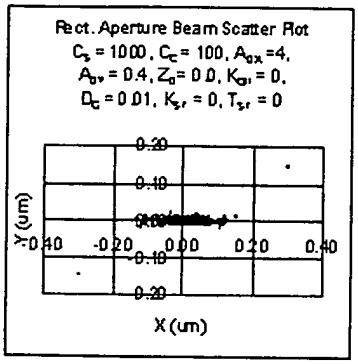


FIGURE 18A

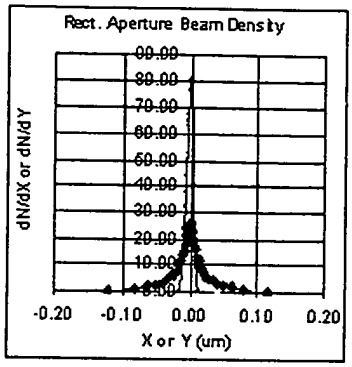


FIGURE 18B

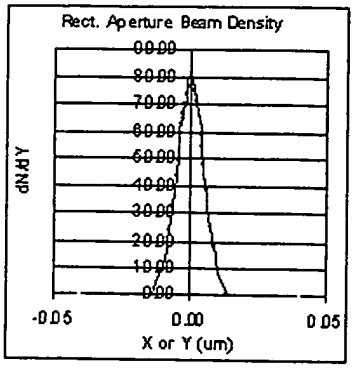


FIGURE 18C

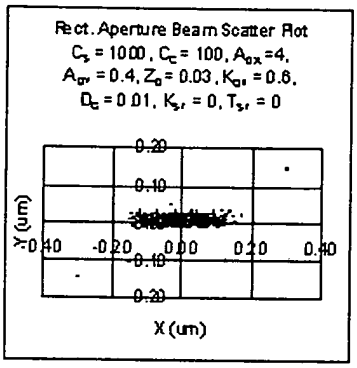


FIGURE 19A

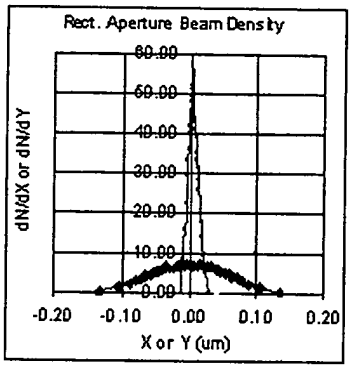


FIGURE 19B

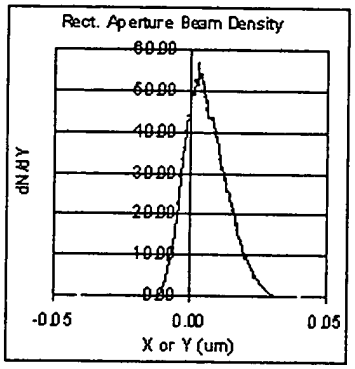


FIGURE 19C

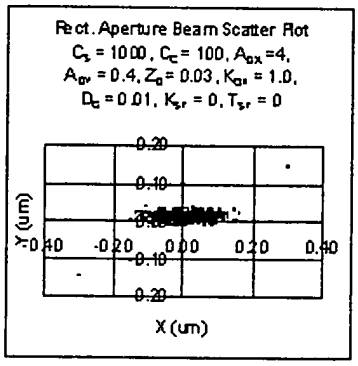


FIGURE 20A

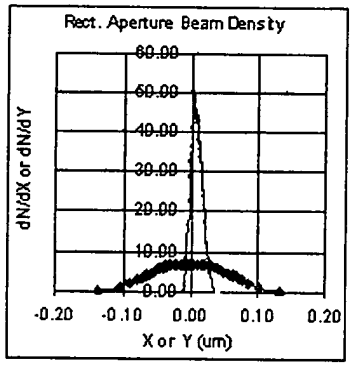


FIGURE 20B

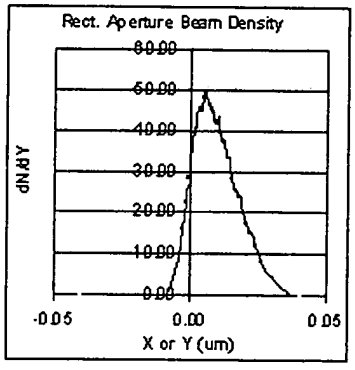


FIGURE 20C

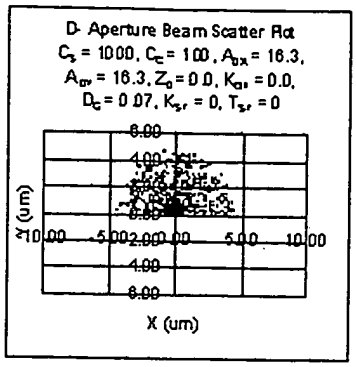


FIGURE 21A

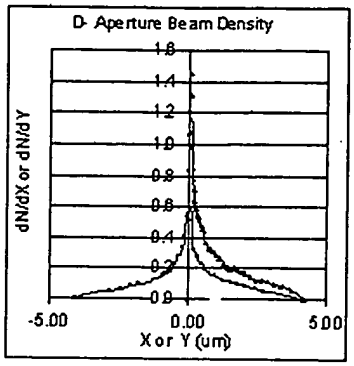


FIGURE 21B

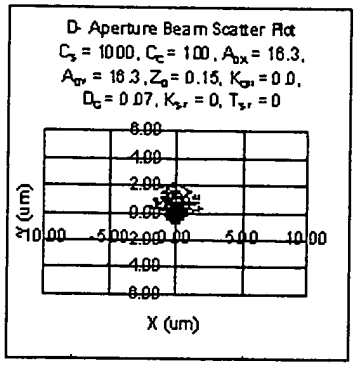


FIGURE 22A

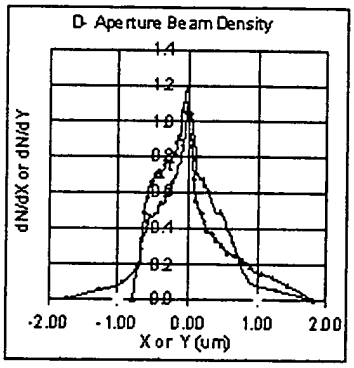


FIGURE 22B

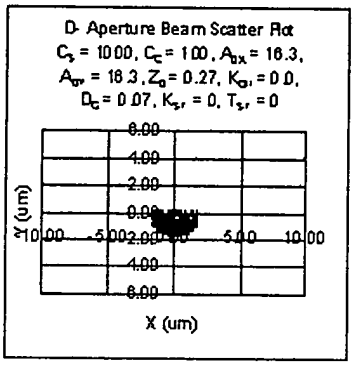


FIGURE 23A

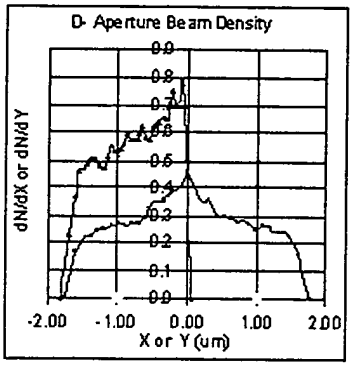


FIGURE 23B

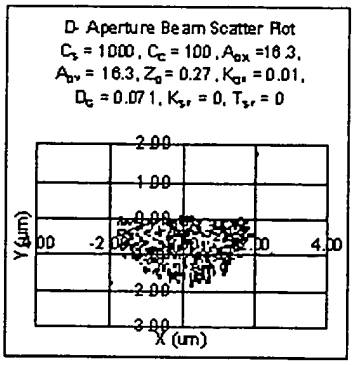


FIGURE 24A

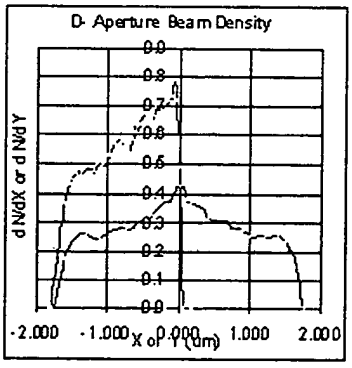
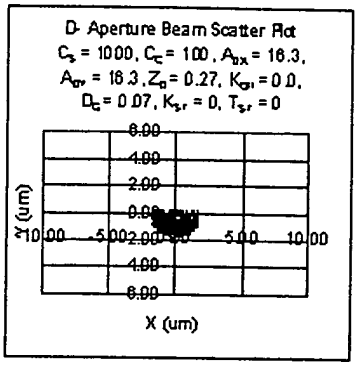


FIGURE 24B



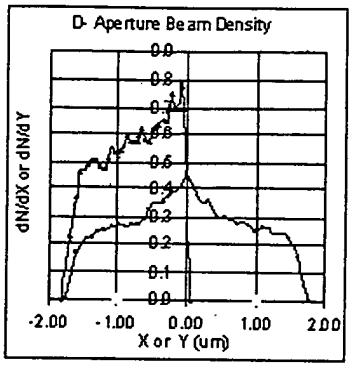
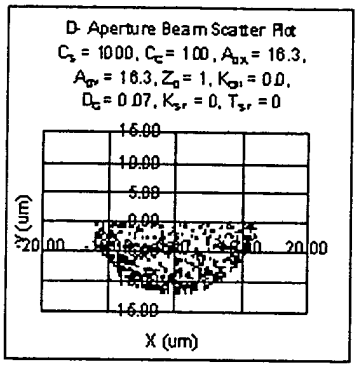


FIGURE 25A FIGURE 25B



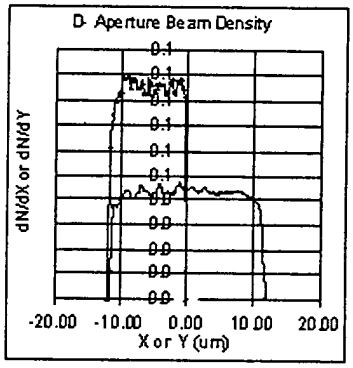
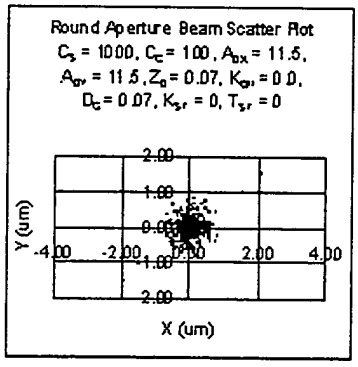


FIGURE 26A FIGURE 26B



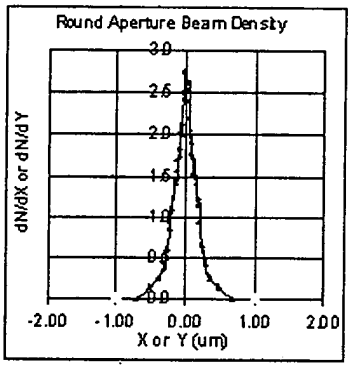


FIGURE 27A FIGURE 27B

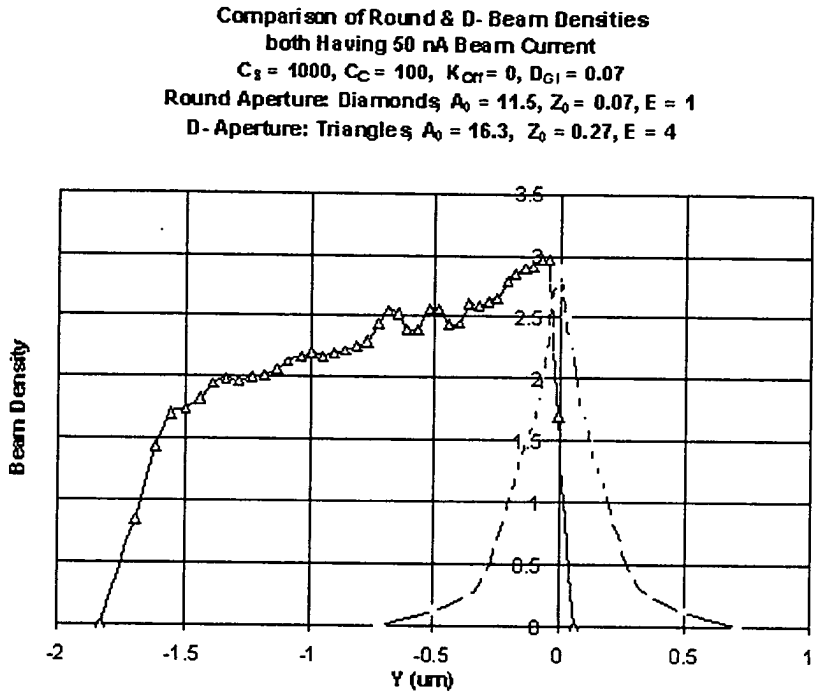
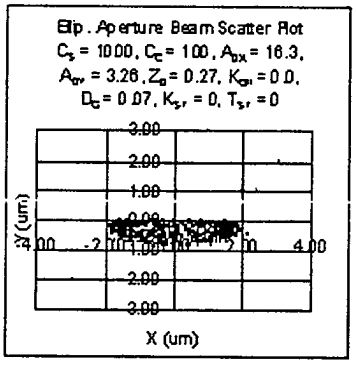


FIGURE 28



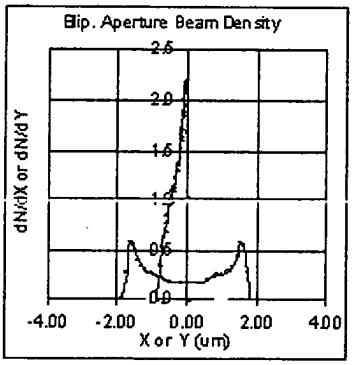


FIGURE 29A

FIGURE 29B

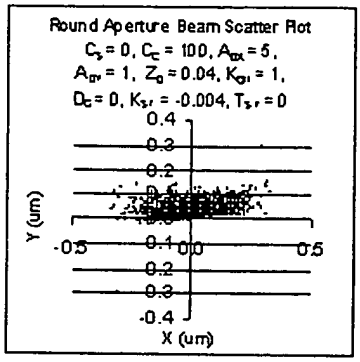


FIGURE 30A

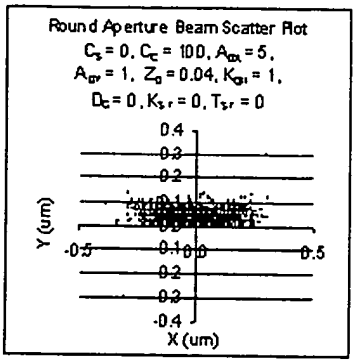


FIGURE 30B

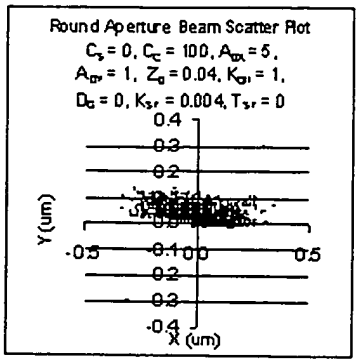


FIGURE 30C

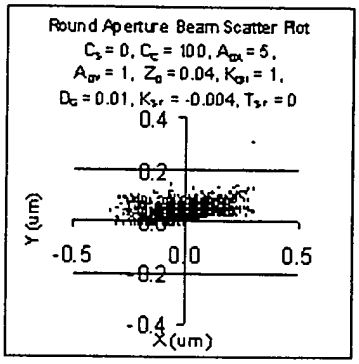


FIGURE 31A

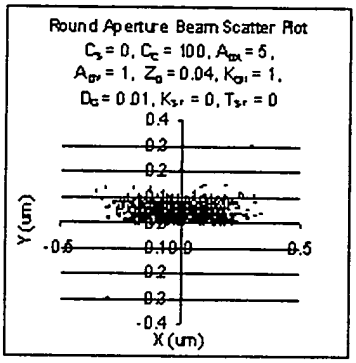


FIGURE 31B

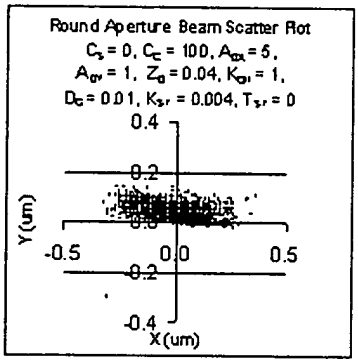


FIGURE 31C

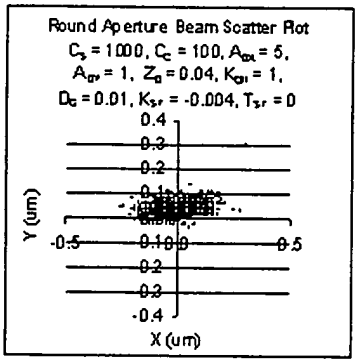


FIGURE 32A

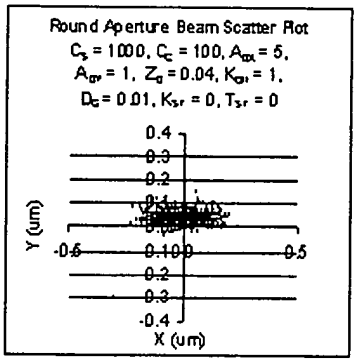


FIGURE 32B

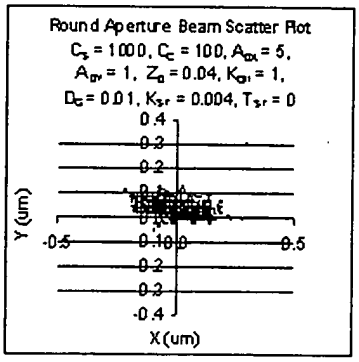


FIGURE 32C

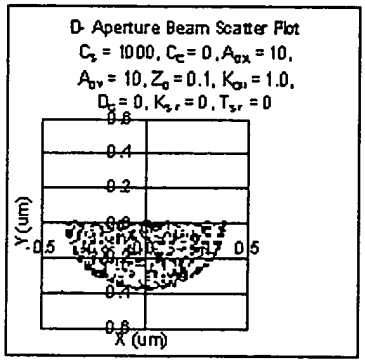


FIGURE 33A

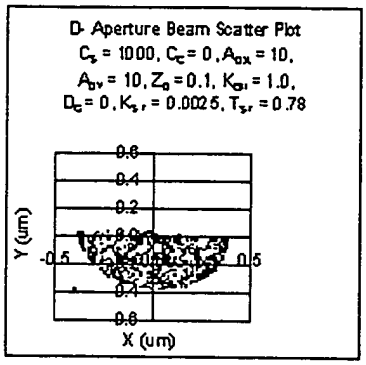


FIGURE 33B

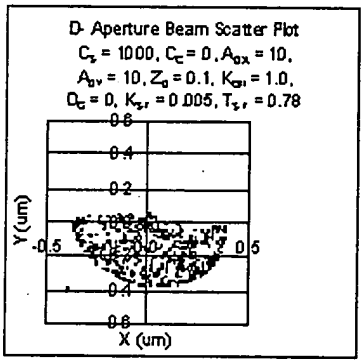


FIGURE 33C

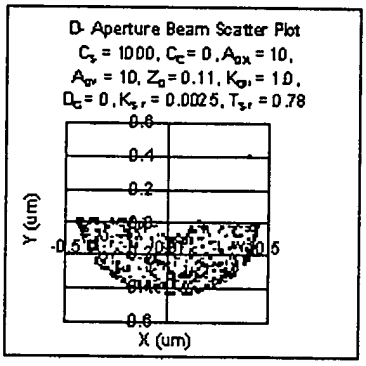


FIGURE 33D

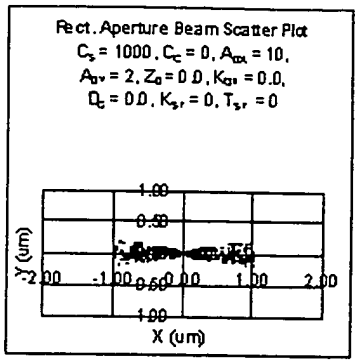


FIGURE 34A

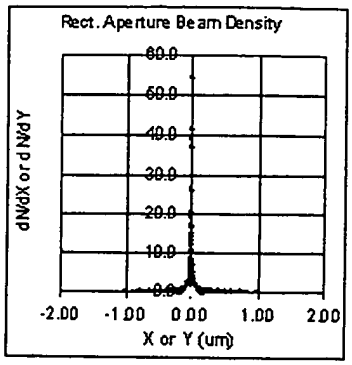


FIGURE 34B

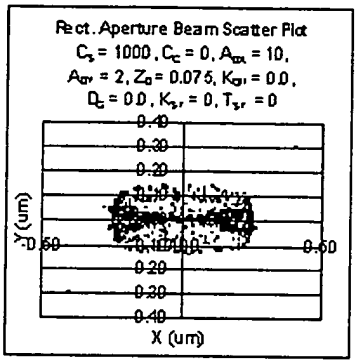


FIGURE 35A

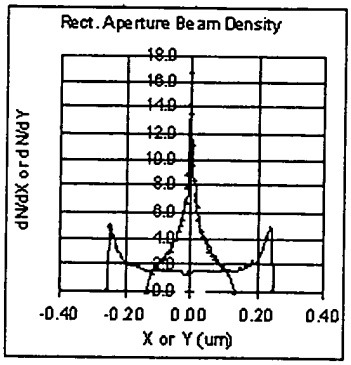


FIGURE 35B

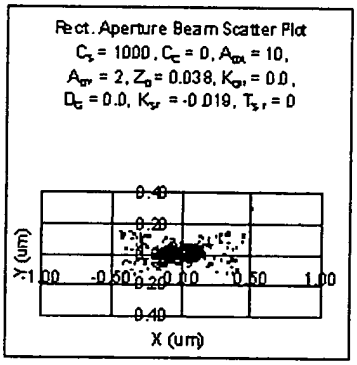


FIGURE 36A

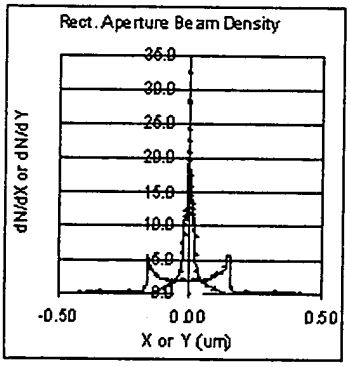


FIGURE 36B

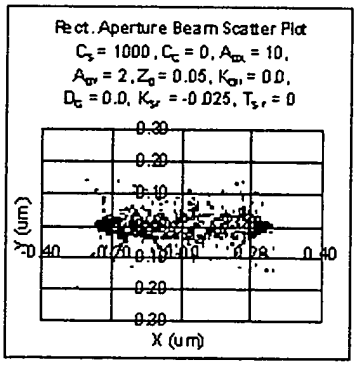


FIGURE 37A

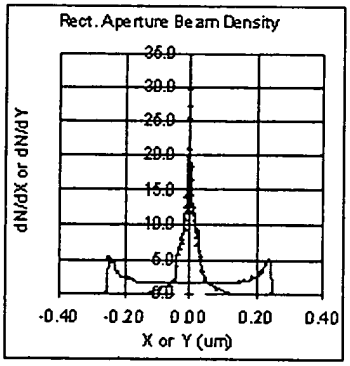


FIGURE 37B

Optical Parameters										Beam Width		15- 85% Rise		
C_S (mm)	C_S (mm)	C_C (mm)	A_{0X} (rad)	A_{0Y} (rad)	Z_0 (mm)	K_{Off}	D_G (µm)	K_{ST} (mm)	I_B (nA)	X_{fw} (µm)	Y_{fw} (µm)	dX (µm)	dY (µm)	Y-Tail Initial Rise (µm)
Small Beams														
Round	1000	100	1	1			.01		.0076	.052	.052	.010	.010	M
Round	1000	100	1	1	.03	1.0	.01		.0076	.083	.094	.022	.013	S
Rect.	1000	100	4	.8			.01		.031	.24	.044	.026	.009	M
Rect.	1000	100	4	.8	.03	1.0	.01		.031	.27	.080	.060	.006	S
50 nA Beams														
Round	1000	100	11.5	11.5	.07		.071		50	1.4	1.4	.26	.26	L
Round	1000	100	11.5	11.5	.07	.5	.071		50	2.9	4.0	.50	.24	VL
D	1000	100	16.3	16.3	.27		.071		50	3.5	1.8	.20	.068	S
Rect.	1000	100	22.7	4.54	.30		.071	-.10	50	6.4	2.3	.2	.60	M

FIGURE 38